POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Heliographic			Area		Total area for each day	Observatory
		Diff. in longitude	Longitude	Latitude	Spot	Group		
	h m	°	°	°				
June 27	8 50	−42.0	144.3	+16.0	4			Mt. Wilson.
		−30.5	155.8	−19.0		16		
		+1.0	187.3	−19.0		150		
		+15.0	201.3	+17.0		439		
		+40.0	226.3	+24.0	10			
		+62.5	248.8	+14.0		3		
		+75.0	261.3	+23.0		151		
		+76.0	262.3	+28.0	3			
		+80.0	266.3	−14.0	22		798	
June 28	11 15	−22.0	149.7	−18.5		46		U.S. Naval.
		−15.0	156.7	−19.5	15			
		+10.0	181.7	−20.0		46		
		+16.0	187.7	−19.0	77			
		+30.0	201.7	+19.0		494	678	
June 29	11 36	−8.0	150.3	−19.0		62		Do.
		+25.0	183.3	−20.0		309		
		+43.0	201.3	+27.0		46		
		+44.0	202.3	+19.0		494	911	
June 30	12 21	+4.0	149.0	−19.0		31		Do.
		+38.0	183.0	−20.0		278		
		+57.0	202.0	+19.0		617		
		+57.0	202.0	+27.0		77	1003	

Mean daily area for 30 days, 741.

PROVISIONAL SUN-SPOT RELATIVE NUMBERS, JUNE 1936

[Data dependent alone on observations at Zurich and its station at Arosa]

[Data furnished through the courtesy of Prof. W. Brunner, Eidgen. Sternwarte, Zurich, Switzerland]

June 1936	Relative numbers	June 1936	Relative numbers	June 1936	Relative numbers
1	78	11	35	21	*bd*119
2	98	12	*Ec*40	22	*b*100
3	*b*65	13	43	23	*Wc*76
4	*Mac*—	14	32	24	71
5	62	15	*d*19	25	*Mc*89
6		16	55	26	*a*112
7	*Ec*69	17	67	27	*a*103
8	73	18	60	28	68
9	64	19	101	29	68
10	*a*40	20	88	30	79

Mean, 28 days=70.5.

a=Passage of an average-sized group through the central meridian.
b=Passage of a large group or spot through the central meridian.
c=New formation of a center of activity: *E*, on the eastern part of the sun's disk; *W*, on the western part; *M*, in the central circle zone.
d=Entrance of a large or average-sized center of activity on the east limb.

AEROLOGICAL OBSERVATIONS

[Aerological Division, D. M. LITTLE in Charge]

By L. P. HARRISON

The normal monthly means of temperature and humidity used as a basis for computing the departures from normal given in table 1 are derived from observations distributed over the following numbers of years: Omaha, 5; Pensacola, 9; Seattle, 6; San Diego, 8; Washington, 11; Norfolk, 8; and Pearl Harbor, 7. The total number of observations represented by the normal in each case is indicated in the note at the foot of the table.

The departures from normal temperature during June in the middle Atlantic coastal area were of negative sign at all levels as evidenced by data for Norfolk and Washington. The departures for Norfolk appear especially significant since they amounted to as much as −2.5° C. at 5 km and at the surface. A scrutiny of the isothermal charts for the month at the various levels disclosed a rather pronounced trend of the isotherms in the general direction WNW to ESE as the coast is approached in the levels from 2–4 km over the northeastern corner of the country. From this and the facts previously adduced, one is led to infer that temperatures were generally below normal in this sector during June, at least at moderate elevations (2.5 km). Furthermore, temperatures for the month in the Lake region appeared below normal in the lower elevations.

The departures from normal of the temperatures at Omaha were mostly positive but small in magnitude; the largest was +1.0° C. at 4 km. The departures at San Diego were all positive except at the surface (−0.7° C.), most of them being small to moderate in magnitude; the largest was +2.0° C. at 5 km. Similarly, the departures at Pensacola were all positive except at the surface (−1.4° C.), most of them being quite small in magnitude, and the largest +0.9° C. at 1 km. Seattle had too few observations (7) to give reliable results in this connection.

The departures from normal relative humidity during June were mostly positive at Norfolk but negative at Washington; the largest was +7 percent at 2 and 2.5 km in the former case, and +12 percent at the surface with −7 percent at 0.5 km in the latter case. At the 4- and 5-km levels, both stations were in agreement by having positive departures of small magnitude (1–4 percent). Isohygrometric lines on the charts for the various levels reveal an outstanding maximum at Mitchel Field, especially at 4 km, and a very rapid decrease in relative humidity southward therefrom; thus at this level monthly means were: Mitchel Field, 73 percent; Lakehurst, 44 percent; Washington, 52 percent; and Norfolk, 49 percent. Boston had a corresponding mean of 57 percent, but this is probably in error by being somewhat too low, inasmuch as this station had but 19 observations during June, whereas Mitchel Field had 25, and a number of the days for which data are lacking at the former place were predominantly days with fog, low ceiling, and rain. We are thus led to infer that probably the free-air relative humidities were generally above normal in a strip along the coast in the northeastern sector of the country. This inference is consistent with the above-normal precipitation during June in this region.

The humidities at Pensacola were mostly below normal but the departures were small in magnitude, with the largest negative departure, −3 percent, at 5 km; however at the surface there was a positive departure of +8 percent.

Omaha had fairly large negative departures in the lowest levels (surface to 1.5 km, m. s. l.); the largest was −10 percent at 0.5 km above sea level (0.2 km above surface). However, small positive departures (1–3 percent) occurred at the 2.5-, 3-, and 5-km levels.

Comparing, on the isohygrometric charts, the data for the two stations last referred to with the data for other stations in the Mississippi-Missouri watershed, there appear to be three outstanding loci or centers with pronounced deficiency of humidity: (*a*) the upper Mississippi-Missouri watershed in the lower levels (surface to about 2 km above sea level), (*b*) the lower Mississippi watershed at moderate and high elevations (2.5–5 km), and (*c*) the Great Lakes region at high elevations (4–5 km). The loci of these three regions are best exemplified

by the following stations, as scrutiny of their data will show: (*a*) Omaha, Scott Field (near St. Louis), Fargo, and Billings; (*b*) Barksdale Field (Shreveport), Kelly Field (San Antonio), Pensacola, Maxwell Field (Montgomery), Murfreesboro, and Scott Field; and (*c*) Selfridge Field (near Detroit).

In the west coast region, departures from normal humidity over San Diego were mostly positive, and in lowest and highest levels quite considerable in magnitude; the largest were +10 percent at surface, and +15 percent at 5 km. The data for Seattle are unreliable owing to fewness of observations (7); however, it appears probable that the departures for the month at that place were actually positive on the whole as indicated in the table.

The upper-air wind *resultants* (see table 2) for June did not depart very greatly from normal either in direction or velocity over the northeast coastal region. It is perhaps significant that the departures in velocity were slightly negative at Boston from the surface to 1 km, but positive from 1.5 to 3 km; the largest was 1.9 m. p. s. at 2.5 km.

At Key West, the resultant at 3 km was rotated about 60° clockwise with respect to the normal in direction, and was 0.9 m. p. s. greater in velocity; at 4 km the directions of the resultant and the normal were practically coincident, but the former was 3.0 m. p. s. greater in magnitude, thus indicating a greater transport of air at these levels from the Gulf of Mexico to the Atlantic. In the lower levels, however (0.5–2.5 km), the monthly resultants were slightly weaker than normal but nearly the same in direction.

An outstanding feature of the June charts of free-air resultant winds was the appearance of an anticyclonic circulation in the States immediately north of the Gulf in the layer from about 1.5 to 3 km. It is very significant for an understanding of the month's weather that, in general, the resultant velocities were below normal on the western side of this circulation, thus reducing the northward transport of warm, moist air up the Mississippi Valley in the lower elevations, whereas they were above normal on the eastern side of the circulation and moreover were rotated clockwise with respect to the normal direction by from 120° to 180° in the layer 1.5–3 km. This signifies that the transport of warm, moist air into the east Gulf States from the Gulf was somewhat deficient. Also relevant in this connection were the excessive values at high levels for St. Louis: 4 km resultant 311°, 7.9 m. p. s., normal 290°, 4.9 m. p. s.; 5 km resultant 312°, 10.8 m. p. s., normal 294°, 5.5 m. p. s. Similarly for Atlanta: 5 km resultant, 330°, 6.2 m. p. s.; normal, 308°, 3.1 m. p. s.

The facts thus adduced are indicative of stagnant conditions in the lower Mississippi and Great Plains region with consequent abnormal warming of the air and lowering of relative humidity, consistent with the data previously discussed.

At the 3-km level the resultant winds over the central part of the country did not, in general, depart much from normal. At the 5-km level, however, in contrast to the positive departures from normal at St. Louis and Atlanta already cited, there were negative departures in velocity of 3.5 and 3.0 m. p. s. at Cheyenne and Albuquerque, respectively, the directions being essentially normal.

The resultants for Salt Lake City were slightly greater in magnitude than the normals with one exception, and in the levels from 2–5 km above sea were oriented about 30°–40° southward from the normal.

Along the west coast the resultant winds exhibited some striking departures from normal. At San Diego the resultant for the month at the surface was oriented about 60° north of the normal and was 0.7 m. p. s. greater in magnitude. The remaining levels for which data were available showed slightly positive departures in velocity but insignificant or small departures in direction. Considering the resultants for Medford, Seattle, and Spokane as a whole, large positive departures in velocity (>3 m. p. s.) and in direction with respect to the normals were the rule at moderate and high elevations (2–5 km). The Oakland resultants did not depart greatly from normal insofar as magnitude was concerned but the departures in direction were large. In general, the directions of the monthly resultants at the four stations last referred to were oriented on the average about 50° counterclockwise (south) of normal. The significance of the facts just presented lies in the larger than normal transport of warm, moist air from the Pacific over the coastal area and adjoining mountain regions with the consequent occurrence during June of an excessively large amount of precipitation throughout the Pacific States (232 percent of normal in California, 161 percent in Oregon, 211 percent in Washington, 172 percent in Idaho, 160 percent in Nevada, and 120 percent in Utah).

TABLE 1.—*Mean free-air temperatures and relative humidities obtained by airplanes during June 1936*

TEMPERATURE (° C.)

Stations	Altitude (meters) m. s. l.																Number of observations
	Surface		500		1,000		1,500		2,000		2,500		3,000		4,000		5,000		
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	
Barksdale Field (Shreveport), La.[1] (52 m)	23.0	-------	25.0	-------	22.5	-------	19.7	-------	17.0	-------	14.7	-------	11.6	-------	4.9	-------	−2.9	-------	30
Billings, Mont.[2] (1,088 m)	16.4	-------	-------	-------	-------	-------	17.4	-------	14.5	-------	10.8	-------	6.9	-------	−0.5	-------	−8.3	-------	29
Boston, Mass.[1] (5 m)	16.1	-------	16.6	-------	13.7	-------	10.7	-------	8.1	-------	5.8	-------	3.2	-------	−2.6	-------	−7.8	-------	19
Cheyenne, Wyo.[2] (1,873 m)	13.8	-------	-------	-------	-------	-------	-------	-------	15.5	-------	14.7	-------	11.8	-------	4.1	-------	−4.3	-------	30
El Paso, Tex.[2] (1,194 m)	23.0	-------	-------	-------	-------	-------	24.5	-------	22.5	-------	18.3	-------	14.2	-------	6.5	-------	−1.6	-------	30
Fargo, N. Dak.[2] (274 m)	14.8	-------	17.2	-------	15.2	-------	13.0	-------	11.0	-------	7.9	-------	4.9	-------	−1.2	-------	−7.8	-------	30
Kelly Field (San Antonio), Tex.[1] (206 m)	22.4	-------	24.1	-------	22.7	-------	19.8	-------	18.0	-------	16.1	-------	13.4	-------	6.4	-------	−0.7	-------	27
Lakehurst, N. J.[3] (39 m)	18.4	-------	18.7	-------	17.4	-------	14.6	-------	12.3	-------	10.3	-------	7.7	-------	2.2	-------	−3.2	-------	22
Maxwell Field (Montgomery), Ala.[1] (52 m)	22.7	-------	24.9	-------	22.7	-------	19.0	-------	15.3	-------	12.0	-------	9.5	-------	3.8	-------	−2.4	-------	30
Mitchel Field (Hempstead, Long Island), N. Y.[1] (29 m)	16.4	-------	17.9	-------	16.0	-------	13.2	-------	10.8	-------	8.6	-------	6.0	-------	−0.4	-------	-------	-------	25
Murfreesboro, Tenn.[2] (174 m)	20.7	-------	24.2	-------	22.4	-------	19.1	-------	15.9	-------	13.1	-------	10.4	-------	4.1	-------	−2.2	-------	30
Norfolk, Va.[3] (10 m)	20.0	−2.5	20.8	−0.7	18.1	−1.2	14.6	−1.7	11.2	−2.0	8.3	−2.1	6.3	−1.5	0.5	−1.9	−5.2	−2.5	20
Oklahoma City, Okla.[2] (391 m)	21.4	-------	23.0	-------	23.1	-------	20.7	-------	18.1	-------	15.2	-------	11.5	-------	3.8	-------	-------	-------	30
Omaha, Nebr.[2] (300 m)	18.6	−0.1	20.2	+0.1	19.9	−0.7	18.3	+0.1	15.5	+0.2	12.1	+0.3	9.1	+0.8	2.6	+1.0	−4.8	+0.4	30
Pearl Harbor, Territory of Hawaii[3] (6 m)	22.8	−2.3	20.8	−1.1	17.5	−0.8	15.2	−0.5	13.7	+0.2	11.6	−0.3	9.5	−0.7	5.0	−1.2	−0.4	−1.5	30
Pensacola, Fla.[3] (13 m)	23.2	−1.4	24.1	+0.8	21.4	+0.9	18.0	+0.4	15.1	+0.4	12.3	+0.4	9.6	+0.6	3.7	+0.5	−2.1	+0.5	30
San Diego, Calif.[3] (10 m)	18.1	−0.8	16.2	+0.3	19.5	+1.9	19.6	+1.4	17.5	+0.1	15.7	+0.8	13.2	+1.2	7.2	+1.4	0.9	+2.0	28
Scott Field (Belleville), Ill.[1] (135 m)	17.4	-------	21.6	-------	20.9	-------	18.1	-------	15.4	-------	12.3	-------	9.3	-------	2.8	-------	−3.9	-------	30
Seattle, Wash.[3] (10 m)	17.0	+1.6	12.0	−0.2	9.4	−0.3	6.9	−0.3	4.8	0.0	2.1	−0.4	−0.1	−0.3	−6.7	−1.9	-------	-------	7
Selfridge Field (Mount Clemens), Mich.[1] (177 m)	13.9	-------	16.5	-------	15.4	-------	12.8	-------	10.3	-------	7.9	-------	5.0	-------	−1.3	-------	−7.7	-------	29
Spokane, Wash.[2] (596 m)	13.6	-------	-------	-------	16.7	-------	16.1	-------	13.4	-------	10.0	-------	6.8	-------	0.2	-------	−6.6	-------	30
Sunnyvale, Calif.[2] (10 m)	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Washington, D. C.[3] (13 m)	18.2	−3.2	19.2	−0.9	17.2	−0.8	14.3	−1.0	11.4	−1.0	8.9	−0.4	6.4	−0.5	0.6	−0.5	−5.0	−0.3	29
Wright Field (Dayton), Ohio[1] (244 m)	16.0	-------	19.4	-------	19.2	-------	16.5	-------	13.9	-------	11.2	-------	8.3	-------	2.0	-------	−4.3	-------	22

RELATIVE HUMIDITY (PERCENT)

Barksdale Field (Shreveport), La.	75	-------	59	-------	54	-------	52	-------	46	-------	36	-------	33	-------	31	-------	30	-------	-------
Billings, Mont.	56	-------	-------	-------	-------	-------	46	-------	46	-------	52	-------	58	-------	60	-------	52	-------	-------
Boston, Mass.	75	-------	62	-------	64	-------	64	-------	62	-------	60	-------	57	-------	57	-------	56	-------	-------
Cheyenne, Wyo.	66	-------	-------	-------	-------	-------	-------	-------	58	-------	49	-------	46	-------	50	-------	57	-------	-------
El Paso, Tex.	34	-------	-------	-------	-------	-------	41	-------	42	-------	44	-------	46	-------	50	-------	55	-------	-------
Fargo, N. Dak.	71	-------	57	-------	54	-------	52	-------	48	-------	51	-------	52	-------	49	-------	50	-------	-------
Kelly Field (San Antonio), Tex.	88	-------	81	-------	71	-------	72	-------	59	-------	48	-------	40	-------	37	-------	36	-------	-------
Lakehurst, N. J.	77	-------	66	-------	56	-------	55	-------	55	-------	51	-------	50	-------	44	-------	41	-------	-------
Maxwell Field (Montgomery), Ala.	82	-------	61	-------	58	-------	61	-------	60	-------	58	-------	49	-------	40	-------	35	-------	-------
Mitchel Field (Hempstead, Long Island), N. Y.	87	-------	78	-------	77	-------	87	-------	73	-------	67	-------	66	-------	73	-------	-------	-------	-------
Murfreesboro, Tenn.	63	-------	54	-------	55	-------	57	-------	59	-------	56	-------	50	-------	46	-------	40	-------	-------
Norfolk, Va.	83	+6	64	−4	62	−2	67	+4	69	+7	66	+7	55	+1	49	+2	43	+4	-------
Oklahoma City, Okla.	70	-------	64	-------	55	-------	53	-------	48	-------	43	-------	42	-------	42	-------	-------	-------	-------
Omaha, Nebr.	73	−7	59	−10	50	−5	47	−6	51	−1	56	+3	54	+2	45	−3	45	+1	-------
Pearl Harbor, Territory of Hawaii.	82	+11	83	+7	85	+4	76	−1	56	−12	45	−8	38	−2	22	0	32	+15	-------
Pensacola, Fla.	90	+8	72	−2	68	−1	67	0	63	−1	58	−2	53	−2	49	−1	41	−3	-------
San Diego, Calif.	84	+10	84	+4	53	−4	37	−2	34	+7	27	+5	27	+8	30	+12	33	+15	-------
Scott Field (Belleville), Ill.	72	-------	53	-------	51	-------	52	-------	48	-------	49	-------	47	-------	42	-------	35	-------	-------
Seattle, Wash.	72	0	76	+2	73	0	72	+1	62	−6	65	+1	64	+5	66	+14	-------	-------	-------
Selfridge Field (Mount Clemens), Mich.	82	-------	63	-------	56	-------	56	-------	53	-------	47	-------	46	-------	42	-------	36	-------	-------
Spokane, Wash.	79	-------	-------	-------	66	-------	64	-------	67	-------	70	-------	71	-------	72	-------	65	-------	-------
Washington, D. C.	84	+12	57	−7	55	−6	57	−5	57	−6	54	−6	52	−4	52	+1	46	+3	-------
Wright Field (Dayton), Ohio	77	-------	65	-------	59	-------	59	-------	57	-------	53	-------	53	-------	55	-------	55	-------	-------

[1] Army. [2] Weather Bureau. [3] Navy.

Observations taken about 4:00 a. m., 75th meridian time, except along the Pacific coast and Hawaii where they are taken at dawn.

NOTE.—The departures are based on "normals" covering the following total number of observations made during the same month in previous years, including the current month: Norfolk, 161; Omaha, 150; Pearl Harbor, 140; Pensacola, 217; San Diego, 172; Seattle, 68; Washington, 231.

LATE REPORT FOR MAY 1936

TEMPERATURE (° C.)

Pearl Harbor, Territory of Hawaii[3] (6 m.)	21.6	−3.2	19.2	−2.0	15.4	−1.9	12.3	−2.2	11.5	−1.1	11.7	−0.2	9.3	−0.9	2.9	−2.1	−5.3	−4.6	31

RELATIVE HUMIDITY (PERCENT)

Pearl Harbor, Territory of Hawaii.	78	+9	80	+6	85	+5	82	+6	61	−3	33	−10	25	−6	19	−2	18	−1	-------

NOTE.—The departures are based on "normals" covering the following total number of observations made during the same month in previous years, including the current month: Pearl Harbor, 139.

TABLE 2.—*Free-air resultant winds (meters per second) based on pilot-balloon observations made near 6 a. m. (E. S. T.) during June 1936*

[Wind from N=360°, E=90°, etc.]

Altitude (m) m. s. l.	Albuquerque, N. Mex. (1,554 m)		Atlanta, Ga. (309 m)		Billings, Mont. (1,088 m)		Boston, Mass. (15 m)		Cheyenne, Wyo. (1,873 m)		Chicago, Ill. (192 m)		Cincinnati, Ohio (153 m)		Detroit, Mich. (204 m)		Fargo, N. Dak. (274 m)		Houston, Tex. (21 m)		Key West, Fla. (11 m)		Medford, Oreg. (410 m)		Murfreesboro, Tenn. (180 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	321	1.2	214	0.6	346	1.7	283	1.3	270	2.4	24	1.0	11	0.6	299	1.6	144	1.3	95	0.3	149	2.6	291	0.8	273	0.8
500	-----	-----	226	2.1	-----	-----	280	4.9	-----	-----	100	2.2	131	.5	299	2.7	185	1.6	150	4.6	155	4.0	279	1.5	224	1.3
1,000	-----	-----	264	3.1	-----	-----	276	5.1	-----	-----	278	.8	281	2.3	301	4.1	278	3.0	149	4.7	162	2.3	293	1.8	271	2.3
1,500	-----	-----	296	2.3	33	1.4	281	6.3	-----	-----	277	4.8	287	4.6	290	5.5	287	4.8	133	4.0	150	2.0	196	.6	287	2.5
2,000	217	2.2	295	2.7	301	.4	277	8.7	261	3.8	276	6.8	280	5.6	294	6.4	286	7.4	108	3.2	144	.6	187	2.1	306	4.0
2,500	238	3.7	325	1.8	259	3.5	269	10.5	253	6.0	285	7.5	287	6.1	304	6.2	304	9.7	82	4.1	207	1.8	206	7.2	300	4.9
3,000	245	3.8	332	2.5	264	5.6	278	11.2	255	6.2	294	8.2	292	6.4	289	5.3	301	10.0	75	4.1	218	3.1	204	9.8	316	4.6
4,000	243	4.4	345	4.1	249	9.1	-----	-----	260	6.4	302	9.2	314	6.6	313	7.0	298	10.0	58	4.5	222	4.8	216	11.3	345	4.8
5,000	249	1.7	330	6.2	254	9.5	-----	-----	273	5.2	317	10.8	344	7.9	308	7.8	-----	-----	48	3.5	-----	-----	230	13.8	-----	-----

Altitude (m) m. s. l.	Newark, N. J. (14 m)		Oakland, Calif. (8 m)		Oklahoma City, Okla. (402 m)		Omaha, Nebr. (306 m)		Pearl Harbor, Territory of Hawaii [1] (68 m)		Pensacola, Fla.[1] (24 m)		St. Louis, Mo. (170 m)		Salt Lake City, Utah (1,294 m)		San Diego, Calif. (15 m)		Sault Ste. Marie, Mich. (198 m)		Seattle, Wash. (14 m)		Spokane, Wash. (603 m)		Washington, D. C. (10 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	360	0.6	225	0.6	158	2.1	128	0.7	-----	-----	2	0.8	180	0.4	149	2.8	325	1.2	117	0.2	146	0.8	180	1.1	282	0.1
500	280	4.9	272	3.1	180	4.3	151	3.1	-----	-----	275	1.3	174	1.8	-----	-----	302	2.5	281	1.7	210	1.4	-----	-----	267	2.5
1,000	293	5.9	286	4.1	204	9.1	197	3.8	-----	-----	244	1.4	271	2.7	-----	-----	311	3.6	278	5.8	191	3.0	208	2.6	286	4.8
1,500	293	6.8	238	2.2	216	6.4	245	4.3	-----	-----	60	.5	281	4.9	160	3.5	289	3.4	288	7.5	205	3.6	230	3.3	290	4.9
2,000	286	7.1	213	3.4	216	4.3	272	5.8	-----	-----	84	1.7	283	6.9	183	3.7	-----	-----	288	7.3	199	4.7	231	4.6	292	6.6
2,500	280	7.5	219	4.3	225	3.1	281	6.7	-----	-----	49	2.1	292	5.8	205	3.9	-----	-----	296	8.0	197	5.8	225	5.1	276	6.7
3,000	286	8.8	212	5.1	235	1.8	284	6.6	-----	-----	45	2.1	309	5.0	217	5.6	-----	-----	289	9.5	206	7.4	237	6.6	275	7.4
4,000	279	9.2	-----	-----	34	1.4	290	9.2	-----	-----	24	3.5	311	7.9	224	7.1	-----	-----	296	12.2	224	8.8	236	10.1	290	5.9
5,000	-----	-----	-----	-----	41	1.3	300	11.3	-----	-----	-----	-----	312	10.8	226	7.8	-----	-----	302	10.0	-----	-----	243	12.7	-----	-----

[1] Navy stations.

RIVERS AND FLOODS

[River and Flood Division, MONTROSE W. HAYES in Charge]

By W. J. MOXOM

The severe flood in the Arkansas River in Colorado, during the last few days of May, passed into Kansas on June 1 and gave bankfull and near bankfull stages from the Colorado line almost to Wichita, Kans. Flood stage was slightly exceeded at Great Bend, Kans. It is estimated that losses to tangible property in Kansas amounted to about $8,000. Approximately 1,800 acres of prospective crops were damaged to the extent of about $4,500 in the reach of the river embracing Dodge City, Great Bend, and Bentley, Kans.

Moderate floods occurred in the North Canadian River from Woodward to Oklahoma City, Okla.; the South Canadian River in the vicinity of Union, Okla.; and the Cimarron River near Perkins, Okla. Losses were estimated to be in excess of $100,000. Owing to the efficient work of the river observer at Perkins, Okla., the losses in that section were much smaller than otherwise would have occurred; they amounted to approximately $3,500. All families along the river in that section were called by telephone, and all movable property, such as shocked wheat, cattle, etc., was removed to higher ground.

Moderate to heavy flooding occurred during the latter part of May and the first few days of June in the Colorado and Guadalupe Rivers in Texas with estimated losses in excess of $500,000.

Minor floods occurred in some of the tributaries of the Colorado River in Colorado during the first few days of June, with little or no damage.

Unusually low river stages prevailed in the Mississippi River and some of its tributaries.

The district center at Portland, Oreg., furnishes the following remarks on the annual rise of the Columbia River:

Precipitation from September 1, 1935, to February 29, 1936, was about normal or slightly above in the Okanagan drainage, slightly below normal in the Kettle River, West Kootenai, and Arrow Lakes drainage and at Revelstoke, and as much as 30 percent below in the Columbia Basin above Golden, British Columbia, and the East Kootenai Basin. According to the Canadian Water Resources Branch at Vancouver, precipitation ranged from 60 percent to 70 percent of the normal for the Columbia drainage in Canada, although at Trail, British Columbia, the amount exceeded the 20-year average.

In southern Idaho the amount of precipitation ranged from 100 percent to 150 percent of normal, in some areas exceeding this average. The amount of water contributed by this section was proportionate. Except for comparatively small areas in Washington, northern Oregon, southwestern Montana, northern, southwestern, and east-central Idaho, where as low as 38 percent of normal was reported, precipitation over the Columbia drainage in the United States was between 75 percent and 100 percent. During the last week in May and the first week in June the rainfall was quite heavy in the mid-Columbia and Snake River drainage.

Snowfall in Canada was about two-thirds of the average, but was solidly packed, the departure being less at the higher elevations. This conclusion is the result of reports from several sources. Two points where snow survey measurements were made substantiate this view. One point, 30 miles northwest of the north end of Kootenay Lake, at an elevation of 6,000 feet, reported 86 percent of the 1935 water content. The other point, which was Sinclair, on the Banff-Windemere highway, at an elevation of